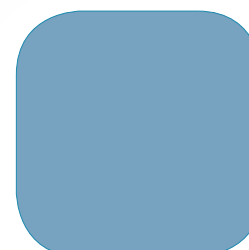
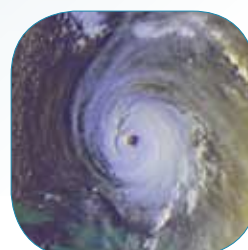
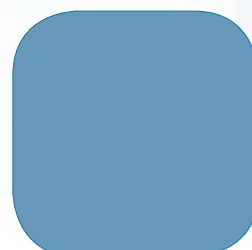
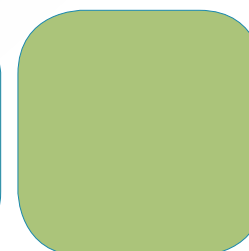
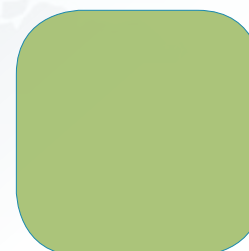
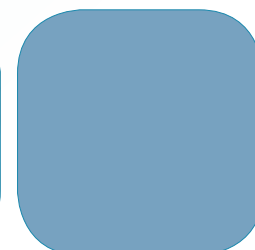
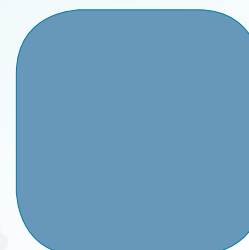
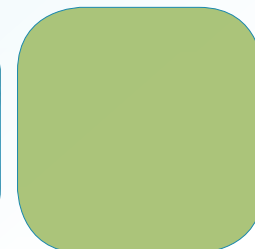
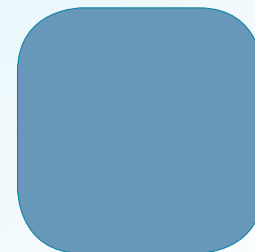
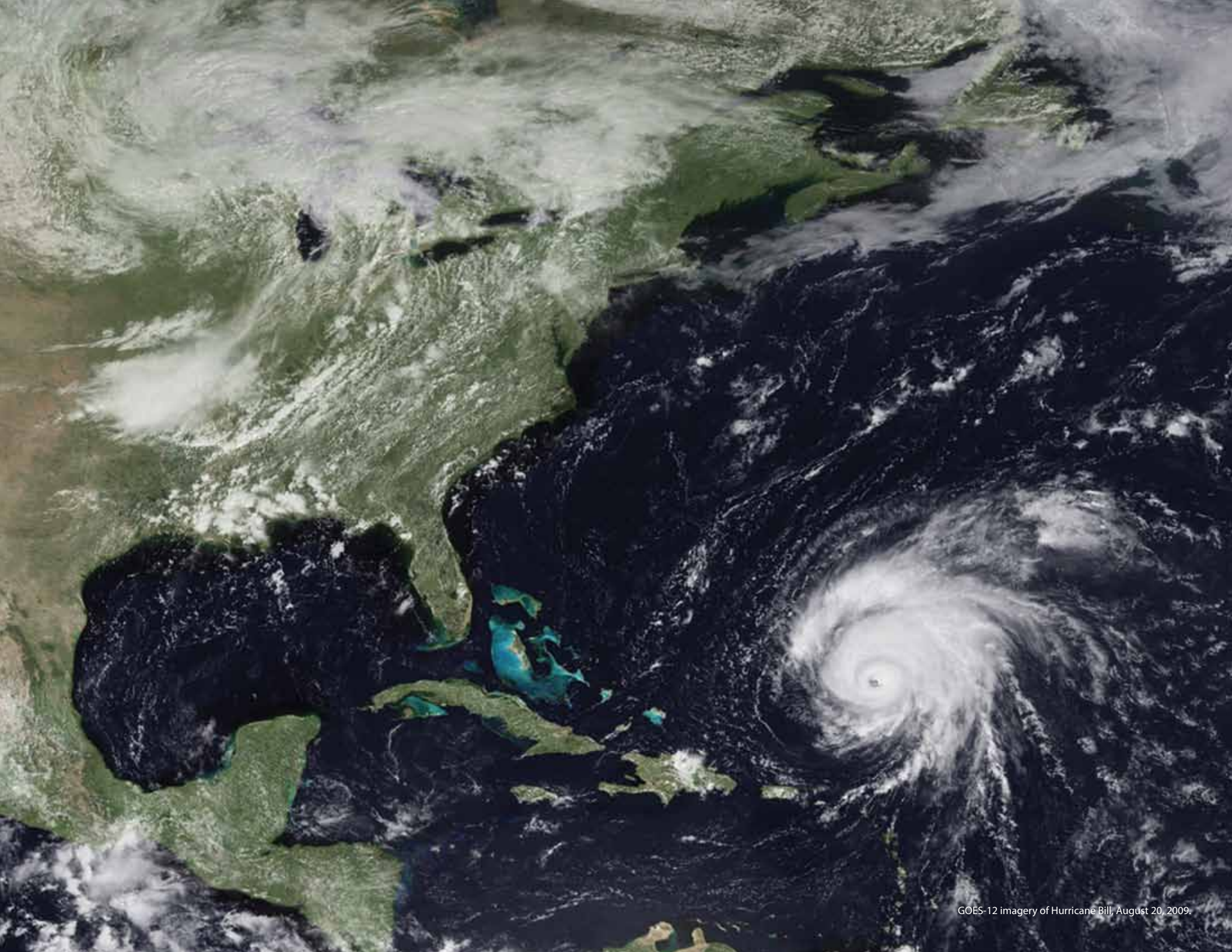


2009 Accomplishments Report

NOAA Satellite and Information Service





GOES-12 imagery of Hurricane Bill, August 20, 2009.



Table of Contents

1	Letter from the Assistant Administrator
2	Top 10 Accomplishments
8	Understanding Climate Variability and Change
10	Providing Weather and Water Information
14	Article: Spotlight on Satellite Ocean Altimetry
16	Managing Ecosystems
18	Supporting Commerce and Transportation
20	Interview: Gary Davis, Director of the Office of Systems Development
22	Awards

Dear Colleagues:

This has been a year of significant challenges and achievements for NOAA Satellite and Information Service (NESDIS)*. We leveraged our core strengths and expanded our existing capabilities to serve new and diverse sectors related to NOAA's mission priorities. In addition, we developed new capabilities to strengthen our ability to provide climate services in a more coordinated manner to be as responsive as possible to the Nation's current and emerging needs for climate information and data.

As we look to the future, we must honor our role as a service agency and continue to remain customer-focused. We have improved our understanding of user needs through data user workshops, roundtables, and regional engagement across the country. And we will continue to work closely with our international, regional, and state partners to understand their needs and how to best address them through open dialogue, tailored products/services, and outreach strategies. We are a leader in providing a full suite of observational and data management resources to stakeholders, and we must remain ever vigilant in our efforts to provide society with timely access to global environmental data. We are working hard to improve and increase the information we can deliver and the ways in which we can deliver it.

In a year filled with leadership changes and high priorities, I commend our dedicated NESDIS employees for their technical expertise, outreach efforts, and innovative, customer-focused products/services. I am encouraged that our commitment to excellence remains a constant in a rapidly changing environment. The individual and collective efforts of NESDIS employees have allowed us to successfully navigate a challenging and transformative year.

I sincerely thank all of you...you really made a difference this year.

Mary E. Kicza



*Officially, NESDIS stands for National Environmental Satellite, Data, and Information Service. Informally, NESDIS is also called NOAA Satellite and Information Service.

Top 10 Accomplishments

1 2 3 4 5 6 7 8 9 10



Photo courtesy of NASA/Jack Pfaller.

Launched a New Polar-orbiting Satellite

NOAA-N Prime successfully launched on Friday, February 6, 2009, from the Vandenberg Air Force Base in California aboard a Delta-II rocket. This new NOAA polar-orbiting operational environmental satellite circles the globe every 102 minutes taking images and measurements to support NOAA's efforts to forecast and monitor the environment. NOAA-N Prime, renamed NOAA-19 after reaching orbit, joins Metop-A, a European satellite, as the operational satellites in polar orbit that NOAA uses in its forecasts. NOAA-19 carries six scientific instruments, two search and rescue instruments, and a data recording system. Unique with this satellite is an advanced data collection system that will relay meteorological and oceanographic data—even track migration patterns of wildlife—to help researchers improve their study of Earth's environment. Data from NOAA-19 supports several NOAA programs, including: weather analysis and forecasting; climate research and prediction; global sea surface temperature measurements; atmospheric soundings of temperature and humidity; ocean dynamics research; volcanic eruption monitoring; forest fire detection; global vegetation analysis; and search and rescue operations. NOAA-19 data helps NOAA monitor current conditions in the atmosphere and oceans and keep tabs on long-term climate trends. These data are increasingly important in Polar Regions, given the potential effects of climate change on the polar ice cap and sea ice extent. NESDIS is working closely with the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) to ensure seamless polar satellite coverage. Under an agreement, two of NOAA's polar-orbiting satellites—NOAA-18 and NOAA-19, both in afternoon orbits—carry a EUMETSAT instrument. In return, EUMETSAT is carrying key NOAA instruments on board its first three Metop satellites, which fly in morning orbits.

Launched NOAA Geostationary Operational Environmental Satellite-O (GOES-O)

The GOES-O spacecraft successfully launched and reached orbit on Saturday, June 27, 2009, from the Kennedy Space Center. GOES-O, now renamed GOES-14, joins three other GOES spacecraft that help NOAA forecasters track life-threatening weather and solar storms by providing reliable satellite coverage to see severe weather as it develops. With more than a thousand tornadoes touching down in the United States each year and the serious risk posed by hurricanes to residents along the Gulf and East coastlines, GOES-14 is critical. GOES-14 is the second spacecraft in the GOES-N/O/P series and carries instruments that capture high-resolution images of weather patterns and atmospheric measurements.



NOAA's newest Geostationary Operational Environmental Satellite – GOES-14 – took its first full-disk visible image of the Earth on July 27, 2009, at 2:00 p.m. EDT.

The imagery and data NOAA gets from GOES spacecraft are key to NOAA's ability to continuously monitor and diagnose weather in the tropics. Continued improvements in the type and quality of GOES data will improve tropical cyclone forecasts. GOES-14 also provides expanded measurements for space and solar environment monitoring using a Solar X-Ray Imager (SXI). The SXI data are improving forecasts and warnings for solar disturbances, protecting billions of dollars of commercial and government assets in space and on the ground and lessening the effect of power surges for satellite-based electronics and the communications industry.

Awarded GOES-R Spacecraft and Ground System Contracts

In December 2008, NOAA and NASA officials announced that the Lockheed Martin Space Systems Company of Denver, Colorado, was selected to build two spacecraft for NOAA's next generation Geostationary Operational Environmental Satellite (GOES) series, GOES-R. On May 27, 2009, NOAA announced that the Harris Corporation Government Communications Systems Division of Melbourne, Florida, was selected to develop the GOES-R ground system. This system will capture, process, and distribute GOES imagery and other information to users around the world.

The GOES-R ground system will be installed and operated at the NOAA Satellite Operations Facility in Suitland, Maryland, and at the Wallops Command and Data Acquisition Station in Wallops, Virginia. The advanced spacecraft and instrument technology used on the GOES-R series will result in more timely and accurate weather forecasts. It will improve support for the detection and observations of meteorological phenomena that directly affect public safety, protection of property, and ultimately, economic health and development, and give us a greater understanding of our changing climate. The first launch of the GOES-R series satellite is scheduled for 2015.

The GOES-R Advanced Baseline Imager (ABI) will provide significant advancements over the current GOES imaging capabilities with three times the spectral, four times the spatial, and more than five times the temporal resolution. Forecasters from NOAA's National Weather Service, one of the primary users of GOES-R data, will see detailed rapid update images of potentially deadly hurricanes every 30 seconds, instead of the current 7.5 minutes. GOES-R will also carry a first-of-its-kind instrument called the Geostationary Lightning Mapper, which will quickly locate all lightning flashes occurring anytime, anywhere in the Western Hemisphere. The lightning mapper will aid in predicting tornadoes, which often spawn from lightning-packed thunderstorms. Other key benefits expected from GOES-R include greater monitoring of surface temperatures in metropolitan areas to improve warnings for heat stress and better data to bolster the forecasts for unhealthy air quality days. GOES-R will feature advanced solar monitoring instruments for space weather forecasts and warnings of solar storms. These storms endanger billions of dollars worth of commercial and government assets in space and cause power surges for the satellite-based electronics and communications industry.

Transitioned the Jason-2 Satellite to Full Operation

The Jason-2 satellite launched successfully on June 20, 2008. On October 29, 2008, after four months of tests and qualification of the entire satellite and the ground

Photo courtesy of Lockheed Martin.



Artist's rendering of GOES-R Spacecraft.

segment, command and control operations for the Jason-2 ocean altimetry satellite were handed over to NOAA from the French Space Agency, Centre National d'Etudes Spatiales (CNES). The handover is a major step in Jason-2 operations. NOAA will now carry out routine operations on the satellite and process the operational data received by its ground stations and interface with users. It will also archive and distribute all scientific products.

On December 15, 2008, NESDIS and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) started publicly distributing Operational Geophysical Data Records (OGDRs) from Jason-2 in near-real-time, within three-to-five hours of observation. The NESDIS team integrated hardware and software provided by partners and contractors into NOAA's Satellite Operations Control Center (SOCC) and Environmental Satellite Processing Center (ESPC), to generate OGDRs from payload telemetry and distribute these products to users worldwide.

In addition to taking over operations of Jason-2, several NESDIS offices collaborated to archive and provide stewardship for critical climate data from Jason-2. This team implemented and maintained all critical archive functions necessary for Jason-2, ensuring long-term preservation and scientific stewardship for the critical climate data generated by this mission. NOAA's National Oceanographic Data Center provided archive services and made the products available using the Comprehensive Large Array-data Stewardship System.

The Jason-2 satellite altimetry mission provides sea surface heights for determining ocean circulation, climate change, and sea-level rise. Altimetry instruments on the Jason-2 satellite meet NOAA's need for sea surface height measurements necessary for ocean modeling, forecasting El Niño/La Niña events, and hurricane intensity prediction.

Released the June 2009 Report *Global Climate Change Impacts in the United States*

Climate change is already having visible impacts in the United States, and the choices we make now will determine the severity of its impacts in the future. This point is emphasized in the *Global Climate Change Impacts in the United States* report, which NESDIS contributed to. The Obama Administration considered this report so significant that it convened a White House press conference to announce its release in June 2009.

This report confirms previous evidence that global temperature increases in recent decades have been primarily human-induced; incorporates the latest information on rising temperatures and sea levels; increases in extreme weather events; and other climate-related phenomena. The report is written in plain language so its findings are readily accessible to the public, the media, and decision makers from all levels and will further NOAA's efforts to promote a climate-literate



Global climate change continues to have visible impacts in the United States.

public. Adding greatly to its practical value in the realm of policy and planning, it is the first such report in almost a decade to break out those impacts by U.S. region and economic sector, and the first to do so in such great detail. The study finds that Americans are already being affected by climate change through extreme weather, drought, and wildfire trends and details how the Nation's transportation, agriculture, health, water, and energy sectors will be affected in the future. The study also finds that the current trend in the emission of greenhouse gas pollution is significantly above the worst-case scenario that this and other reports have considered. Because the report results are divided into region and economic sectors, it provides a valuable tool not just for policymakers, but for all Americans who will be affected by these trends. Its information can help: farmers making crop and livestock decisions; as growing seasons lengthen, insect management becomes more difficult and droughts become more severe; local officials thinking about zoning decisions, especially along coastal areas; public health officials developing ways to lessen the impacts of heat waves throughout the country; water resource officials considering development plans; and business owners as they consider business and investment decisions.

Integrated Ocean Color Observations

NESDIS researchers made significant progress in fiscal year (FY) 2009 advancing the development of the NOAA end-to-end satellite ocean color radiometry system. This system is key for supporting multiple NOAA line office and goal team/program activities, and several important milestones were met during FY 2009. For example, Medium Resolution Imaging Spectrometer (MERIS) chlorophyll-a (a proxy for phytoplankton biomass) ocean color radiometry products were declared operational in January 2009 and are now routinely posted on the CoastWatch website. In addition, Moderate Resolution Imaging Spectroradiometer (MODIS) regional chlorophyll-a products for the Chesapeake Bay region were declared operational in February 2009 and are on the CoastWatch website. CoastWatch is now making standardized MODIS ocean color data available for the Gulf of Mexico region; additional regions will be online shortly. Collectively, these efforts are helping to facilitate continuity and accessibility of quality ocean color data and derived products in support of NOAA and external users and their operational and climate applications, particularly in the areas of integrated ecosystem assessments, harmful algal bloom forecasts, and water quality monitoring in the Chesapeake Bay and other important coastal regions.

Contributed to the Rescues of 184 People

In fiscal year 2009, NOAA satellites were key factors in the rescues of 184 people throughout the United States and its surrounding waters thanks to the Search and Rescue Satellite-Aided Tracking (SARSAT) Program. In each incident, NOAA satellites detected and located a distress signal from an emergency beacon and relayed the information to first responders on the ground. NOAA's polar-orbiting and geostationary satellites, along with Russia's COSPAS spacecraft, are part of the international Search and Rescue Satellite-Aided Tracking system, called COSPAS-SARSAT. This system uses a network of satellites to quickly detect and locate distress signals from emergency beacons on board aircraft and boats and from handheld personal locator beacons. When a satellite finds the location of a distress signal within the United States or its surrounding waters, the information is relayed to the SARSAT Mission Control Center at NOAA's Satellite Operations Facility in Suitland, Maryland. From there, it is sent to a Rescue Coordination Center, operated by either the U.S. Air Force, for land rescues, or the U.S. Coast Guard, for water rescues. Now in its 27th year, COSPAS-SARSAT has been credited with supporting more than 25,000 rescues worldwide, including 6,134 in the United States and its surrounding waters.



2009 SARSAT Rescue Highlights:

- Six people were rescued from a fishing vessel off the coast of Freeport, Texas, when their boat became disabled.
- One person was rescued near Barrow, Alaska, after his snow mobile broke through the ice when crossing the Chip River.
- One person was rescued from a crashed helicopter 18 miles north-northeast of Santa Fe, New Mexico.

Provided New Adjusted Data to Reduce Uncertainty in U.S. Temperature Trends

In fiscal year 2009, NOAA's National Climatic Data Center (NCDC) released a new set of adjusted temperature data from the U.S. Historical Climatology Network. This new adjusted data allow users to monitor changes in surface temperatures across the United States and to place them in historical context. The unadjusted temperature data can be biased by factors such as changes in observing practices, instrumentation, and the station environment. For example, the move of a temperature observing station to a nearby location can cause recorded temperatures that are slightly different than they were in the previous location. Unless the temperature record is adjusted to account for this artificial change, the analysis of temperature trends could result in inaccurate conclusions. Adjustments also are required for other influences such as changes in instrumentation or changes in the station environment (e.g., vegetation growth or urbanization). These changes are sometimes documented in climate records, but often they are not. These new adjusted data is the first dataset of conterminous U.S. temperatures adjusted to account for the influence of documented and undocumented changes in the temperature observing record.

All efforts to understand how the Earth's climate is changing begin with the study of observed changes in surface temperature. This dataset is the cornerstone for the study of climate change in the United States, providing the source of information that establishes the foundation for climate change research and the scientific understanding of how natural and manmade influences have affected the climate of the conterminous United States since the 1800s. It is the source of data from that conclusions have been reached regarding trends and variability in U.S. surface temperature; a key component to the recently released U.S. Global Change Research Program report *Global Climate Change Impacts in the United States*.

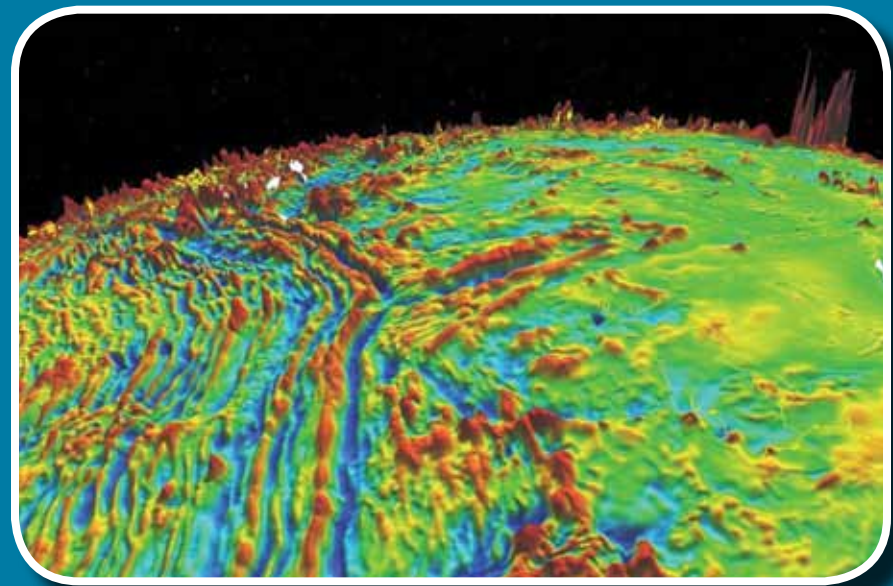
Created an Innovative Model that Enables Better Severe Weather Forecasting

To increase our severe weather forecasting ability, NESDIS developed a new use for Geostationary Operational Environmental Satellite 12 (GOES-12) sounder data. NOAA can now forecast the onset of severe weather, such as thunderstorms and tornadoes up to six hours in advance. NESDIS collaborated with scientists at the Cooperative Institute for Meteorological Satellite Studies, University of Wisconsin, to develop and test this model. Using hourly multilevel

water vapor observations from the GOES-12 sounder, scientists can track regions where upper level drying is occurring over low-level moistening. A rapid change in these measurements is often a precursor to severe weather development.

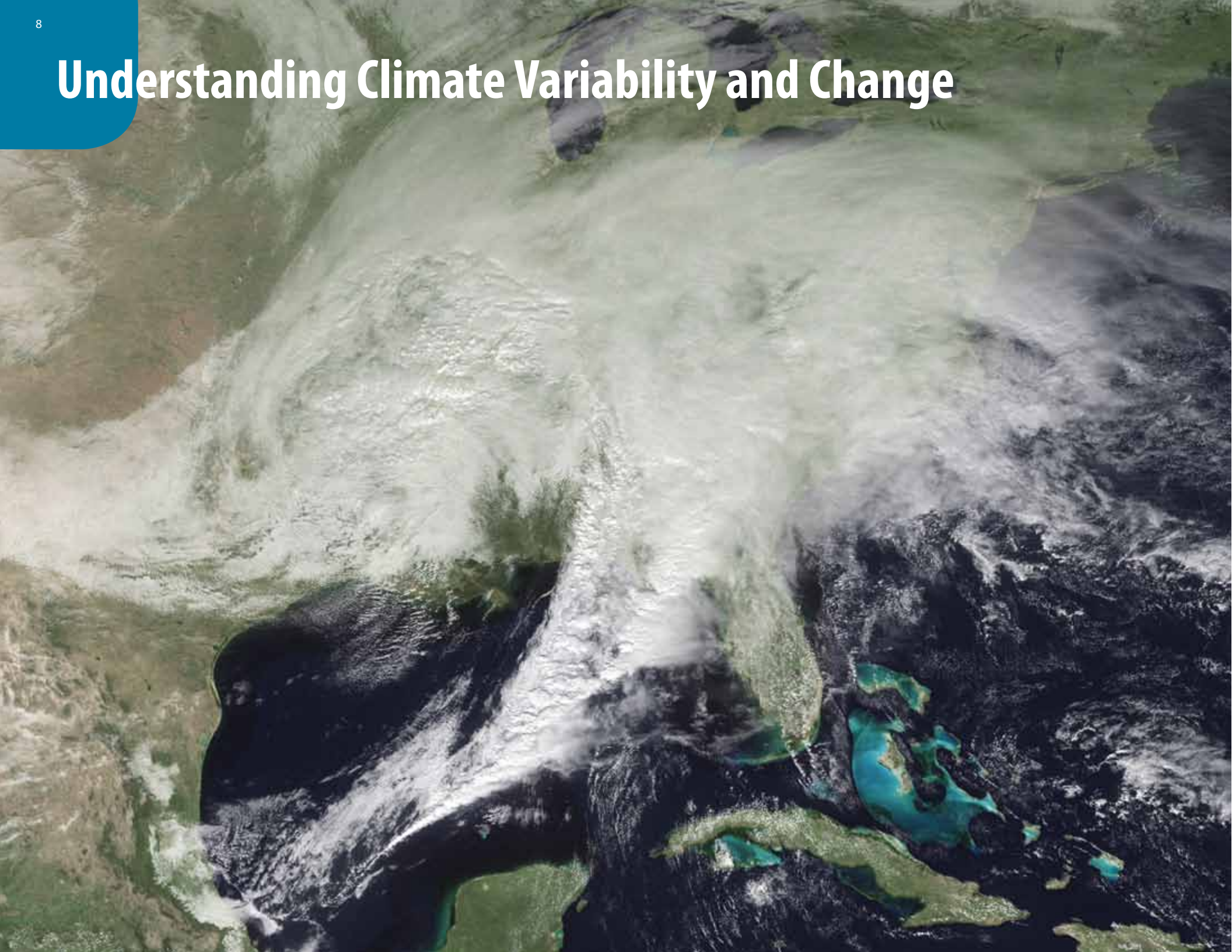
Developed a Higher Resolution Magnetic Field Model

In March 2009, NOAA's National Geophysical Data Center (NGDC) supported safe navigation by developing a new, much higher resolution model of Earth's magnetic field. This new model captures not only the field generated from the interior of Earth's core, but also the anomalous field in the crust, a major source of error when navigating by magnetic compass. Magnetic anomaly maps enable improved navigation and are widely used in the geological sciences, in resource exploration, and in science education to illustrate various aspects of Earth evolution such as plate tectonics and seafloor spreading. All maps, compasses, GPS units, and even iPhones rely on magnetic models to provide the orientation difference between true, geographic, and magnetic north. The new and improved model, designated EMAG2, will lead to more accurate navigational capability for ships and aircraft.



The new EMAG2 looking north-west at Portugal/Spain from the Atlantic. Kursk (Russia) is seen as a strong anomaly in the background. The stripes on the left of the image are magnetic lineations due to sea-floor spreading.

Understanding Climate Variability and Change



Unified the Global Tropical Cyclone Best Track Data

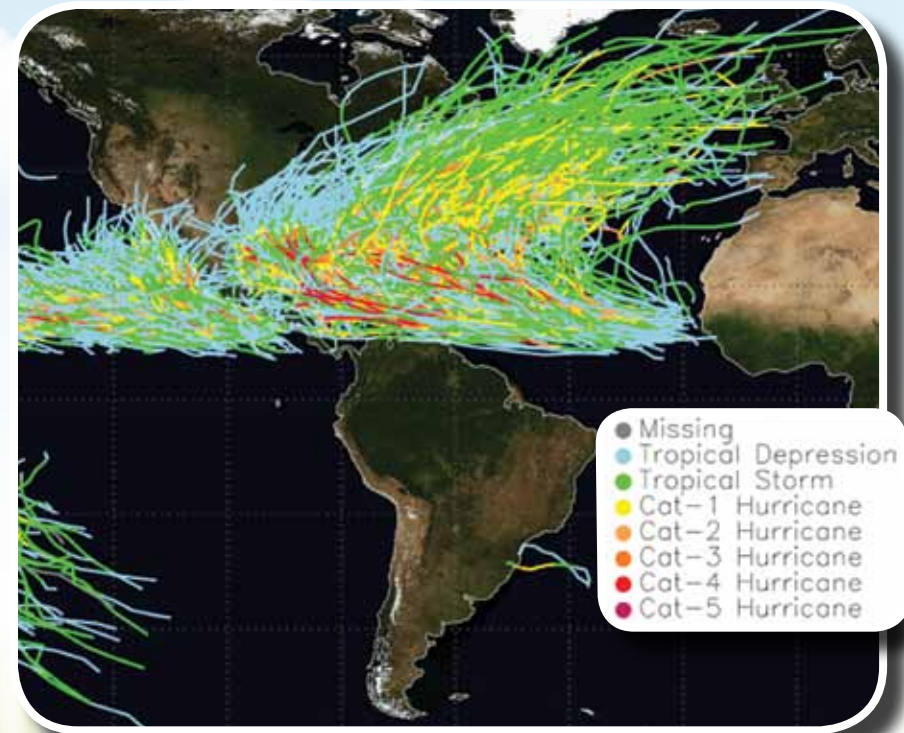
In July 2009, NOAA's National Climatic Data Center (NCDC) released the International Best Track Archive for Climate Stewardship (IBTrACS) global tropical cyclone dataset. IBTrACS is a new dataset based on the best track data from numerous sources by consolidating and unifying data to one location. This dataset is the culmination of tropical cyclone best track data from many available sources, including the World Meteorological Organization's officially recognized Regional Specialized Meteorological Centres and Tropical Cyclone Warning Centres. NCDC personnel collected, combined, and quality controlled the data; vetted the process through the scientific community; and publicly distributed the dataset. Tropical cyclone best track data are used to monitor the positions and intensities of tropical cyclones and include the po-

sition, maximum sustained winds, and minimum central pressure of tropical cyclones at six hour intervals. IBTrACS facilitates an improved understanding of global tropical cyclone distribution, frequency, and intensity.

Despite the significant impact of tropical cyclones on society and natural systems, there was no central repository for global best track data prior to the development of IBTrACS. A comprehensive archive of global tropical cyclone best track data was sorely needed, since such a database is utilized for a wide variety of projects, including climate change research, the determination of appropriate building codes for coastal zones, risk assessments for emergency managers, and analyses of potential losses for insurance and business interests.

Created a New Guide to Improve Public Climate Literacy

In March 2009, NOAA, working with several NESDIS offices and centers among others, issued a climate literacy guide to help individuals of all ages understand how climate influences them—and how they influence climate. A product of the U.S. Climate Change Science Program, this guide was compiled by an interagency group led by NOAA. The 13-page guide includes information on how people can help reduce climate change and its impacts. It also defines important terms and concepts used when talking about climate and approaches to adaptation and mitigation. NOAA, the National Science Teachers Association, and the Technical Education Research Center, an educational non-profit organization, are working with education leaders to revise state standards using this framework. The materials will also provide the basis for educator resources and professional development.



IBTrACS storm tracks for seasons 1947 through 2007.

In fiscal year 2009, NOAA's National Oceanographic Data Center completed, published, and made available online the "World Ocean Database 2009" (WOD09). This updated database contains an additional one million temperature profiles and an additional one million salinity profiles for the world ocean not previously available in one consistent format. WOD09 will allow scientists to better understand the role of the ocean as part of Earth's climate system.

Providing Weather and Water Information



Implemented New NODC User Services and Communications Team

The National Oceanographic Data Center (NODC) created a new NODC User Services and Communications Team to focus on customer service and outreach and to ensure a quick response to user requests. NODC increased the efficiency of its information services and now responds to all data and information requests within 48-72 hours. In addition, NODC's goal is to complete more difficult data requests within one week, and they eliminated a back-log of requests that lingered from previous years. With our customers now obtaining a quick response, they know a live person is available at NODC to help them. These new services help more scientists and members of the public than ever before by allowing a timely response to requests for important ocean data and information.

Achieved Exceptional Performance and Efficiency at the Fairbanks Command and Data Acquisition Station

The Fairbanks Command and Data Acquisition Station (FCDAS) met an outstanding performance goal of 99.8 percent for data recovery during fiscal year 2009. FCDAS took in excess of 56,000 spacecraft communications during the calendar year 2009, a new station metric achievement, matching the metric the entire NASA Ground Network will achieve during 2009. This metric is significant, as it is approaching a 200 percent increase in spacecraft operations since January 1, 2003, and it was accomplished without an increase in staff or support contract modifications.

Sensors aboard environmental satellites collect massive amounts of data on the atmospheric, oceanic, and terrestrial conditions throughout the world. The data are stored on-board the spacecraft for a portion of an orbit and then transmitted down to FCDAS when the satellites pass over the station. FCDAS sends radio signals to the satellites to direct operation of their propul-

sion and sensor systems. Space-based navigation, weather, communications, reconnaissance, and imagery data are valuable to many national and international operations. FCDAS contains antennas, electronic equipment, and support facilities designed to provide radio communications with satellites observing the Earth. Due to its location at high latitude, FCDAS is well-positioned to achieve line-of-sight with polar-orbiting satellites as they converge on the North Polar Region.

In fiscal year 2009, work began to build a new 20,000 square foot satellite operations facility in Fairbanks, Alaska. The project will replace the existing Command and Data Acquisition Station building, which has been in operation since 1961. FCDAS is required to be rebuilt due to seismic instability issues. Estimated for completion in September 2010, the new facility will continue to gather information from satellites that NOAA uses to track weather and to better understand climate change. The project will ensure that NOAA's Fairbanks satellite operations continue until 2026.

Photo courtesy of Constance Ledlow.



Dr. Virgil Sharpton, Vice-Chancellor for Research, University of Alaska Fairbanks; Jay Reich, Deputy Chief of Staff, DOC; Kris Sarri, Senate Committee on Commerce Science and Transportation; Colonel Reinhard Koenig, Alaska District Commander, U.S. Army Corps of Engineers; Mary E. Kicza, Assistant Administrator for Satellite and Information Services; Jane Lubchenco, Under Secretary of Commerce for Oceans and Atmosphere; Lance Seman, Station Manager, FCDAS.

Created a Remote Backup System to Protect Critical Data and Products

In order to safeguard the vast amount of critical data and information provided through the NOAA Satellite Operations Facility (NSOF) in Suitland, Maryland, NESDIS created a remote backup system at our Wallops Island, Virginia, facility. In the event of a disaster at NSOF, this remote backup system will continue to process and distribute critical environmental satellite products. NESDIS personnel not only resolved the network and infrastructure issues to create this backup facility, but also ensured that the computing infrastructure was continuously synchronized with the primary facility at NSOF to minimize potential loss of service and product degradation resulting from a switchover to the backup facility. This system ensures that if a disaster occurs that disables NSOF, NESDIS will be able to continue to provide all



A view of the Wallops Island, Virginia, facility.

critical products to the National Weather Service, Department of Defense, and other users with minimal interruption of service. This ensures the availability of continuous and timely environmental information to the Nation.

Created Two Blended Total Precipitable Water Products

When a flooding event is imminent, timely watches and warnings are essential to saving property and lives. To help users of this type of data make informed decisions quickly, several NESDIS offices collaborated to create two Blended Total Precipitable Water (TPW) products. One of the major benefits that the blended TPW products can provide to users is reduced analysis time, which leads to longer lead times for watches and warnings. Forecasters have limited time to synthesize all of the information they have available, in particular, when a flooding event is taking place. Thus, the blended TPW products are a big help, allowing them to predict the start and end of an event. The products are being used by NWS forecasters and satellite analysts to support their daily analysis and forecasting.

Focused on Space Weather Impacts on Society

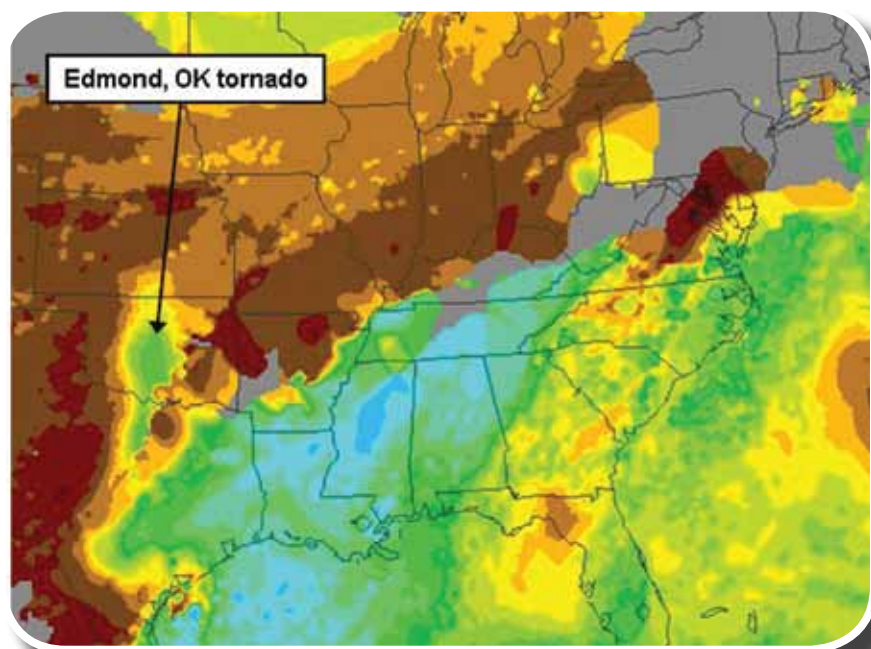
During fiscal year 2009, the National Geophysical Data Center (NGDC) space weather team focused on developing tools, techniques, and models to help decision makers and the public understand the impacts of space weather on their systems. These new tools include improved measurements of the ionosphere (part of the Earth's atmosphere) and a model of global radio wave absorption in the ionosphere. Improved modeling and forecasting of space weather phenomena promotes increased safety for transportation, improved reliability in

The GOES-R Algorithm Working Group reached a key milestone by developing initial versions of the algorithms to be used to generate GOES-R data products. The algorithm packages will facilitate the GOES-R ground system's ability to provide weather information to the public with enhanced quality, timeliness, and efficiency.

satellite operations and communications, and decreased risk of space weather-induced hazards to power companies, airlines, and satellite operators.

Created an Innovative Model that Enables Better Severe Weather Forecasting

To increase our severe weather forecasting ability, NESDIS developed a new use for Geostationary Operational Environmental Satellite 12 (GOES-12) sounder data. NOAA can now forecast the onset of severe weather, such as thunderstorms and tornadoes, up to six hours in advance. NESDIS collaborated with scientists at the Cooperative Institute for Meteorological Satellite Studies, University of Wisconsin, to develop and test this model. Using hourly multilevel water vapor observations from the GOES-12 sounder, scientists can track regions where up-



Three-hour near-cast of vertical lapse rate of available moisture, lower layer minus upper layer, valid 20 UTC, February 10, 2009. An EF2 tornado was reported at this time in Edmond, OK.

In fiscal year 2009, NESDIS reached three milestones in the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program:

- Completed the NPOESS Preparatory Project (NPP) Mission Operations Review (MOR). The successful MOR verifies that the NPP mission requirements are supported by the operations concept, ground systems architecture, and organizational and staffing plans. This is a major component in demonstrating the probability of a successful mission.
- Completed the System Requirements Review (SRR) and Preliminary Design Review (PDR) for the NPOESS Environment Monitor (SEM-N) sensor suite. SEM-N data will be vital for specifying terrestrial space weather phenomena that can adversely affect military and civilian systems that operate within and/or through space.
- Completed the SRR and Sensor System Requirements Design Review (SRDR) for the NPOESS Microwave Imager/Sounder (MIS). Data from this instrument will contribute to many datasets such as weather information, sea surface winds, atmospheric temperature and moisture, and cloud information.

per level drying is occurring over low-level moistening. A rapid change in these measurements is often a precursor to severe weather development.

Rescued Historical Solar Drawings

NESDIS uncovered a source of solar drawings from the Wendelstein Observatory in Austria for the period from 1946 to 1987. These drawings were largely forgotten but represent a key source of information regarding solar features (sunspots, solar flares, etc.) during the transition from ground-based solar observations to space-based. Through an arrangement with the University of Munich, NESDIS temporarily acquired the original drawings and digitally preserved them through the NOAA Climate Data Modernization Program. These data are now available to space scientists, climate researchers, and the public through the NOAA Data Centers.

Spotlight on Satellite Ocean Altimetry: Reading the Waters

More than 71 percent of the Earth's surface is covered by water that is in constant motion. Slow variations in global ocean sea level happen every year, and these changes can pose threats to coastal environments and increase erosion and flooding. In addition, the Earth's oceans absorb and transport significant amounts of solar energy over great distances through currents. This ocean heat affects the intensity of destructive hurricanes, tropical storms, and other weather phenomena that claim lives and destroy property. More than 146 million people worldwide, including 4 million in North America, live within one meter above the average high tide mark and are at risk of flooding. In the United States there is an estimated 2,400 miles of major highways and 246 miles of freight rail at risk of flooding and global sea level increase.

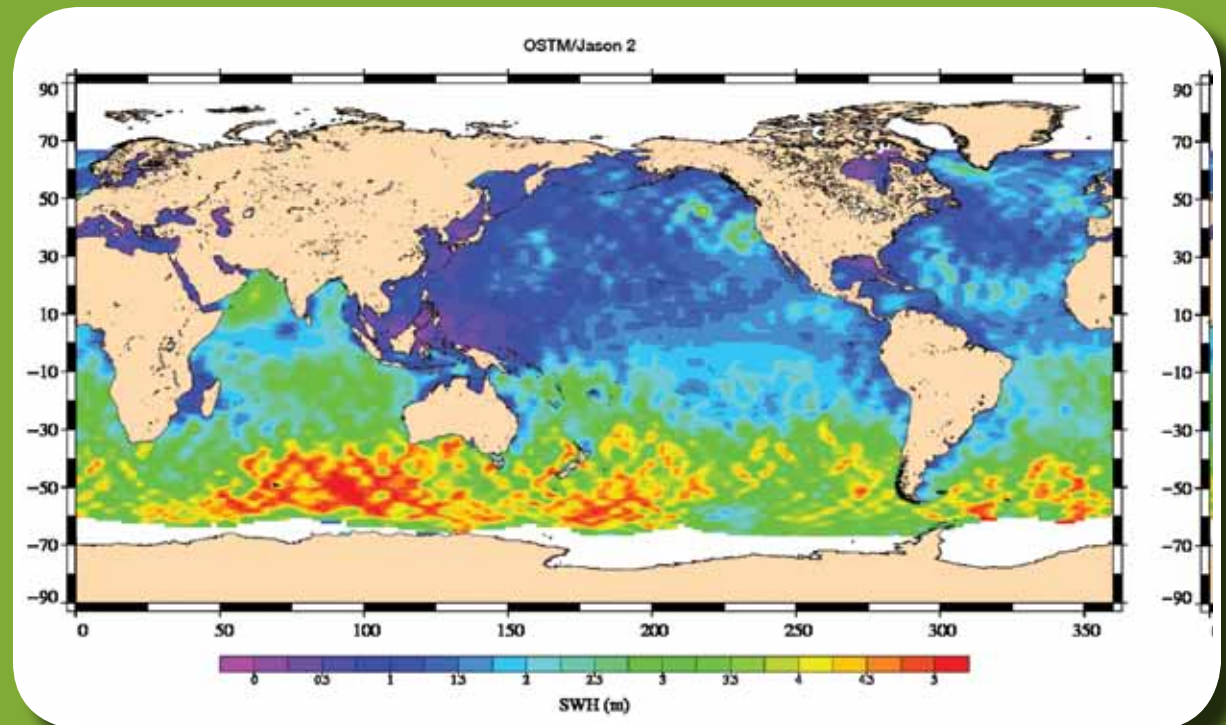
The Measurement

Satellite ocean altimetry is the measurement of sea level height. This extraordinarily precise measurement reveals upper level ocean heat content and patterns and indicates changes in the volume of water. Studying oceans is essential to understanding our climate because they have a major influence on weather.

With this information, scientists can predict hurricane and other severe weather intensity and can forecast climate change. In addition, satellite ocean altimetry allows us to discern El Niño and La Niña cycles—cycles vitally important to short-term climate prediction—and detect currents, such as the Gulf

High precision ocean altimetry measures the distance between the satellite and the ocean surface to within a few centimeters. Sound observations of changes in sea surface height—also known as ocean topography—provide scientists with information about the speed and direction of ocean currents and heat stored in the ocean.

Stream. The current information provided by ocean altimetry is detailed enough to show the location, width, and temperature differences in adjacent waters and detect and predict current eddies, temporary ocean features that can be of critical interest to ocean users such as drilling operators in the Gulf of Mexico. The most important application of these worldwide data is an accurate understanding of long-term climate change trends. If the Earth is indeed heating up, this satellite



OSTM/Jason-2 map of significant wave height from July 4 to July 14, 2008.

information will provide one of the most definitive measures of the Earth's heat gain, allowing validation of climate change research work.

The Satellites

In 1992 the TOPEX/Poseidon satellite—a joint United States-French mission—was launched. This data record continued with the first Jason satellite, Jason-1, which was launched in 2001. The current ocean surface topography sentinel, Jason-2, launched in 2008. The Jason-2 mission is the first instance of research from NASA being fully transitioned into NOAA operations.

Preserving the continuity of these data is essential to accurately assessing these slow but constant changes in our environment. Long-term, continuous data collection is needed for detecting annual, decadal, and centurial variation in climate and oceanography. Continuity will also aid in determining whether these effects are natural variations or the results of human interactions with the environment. The multi-decadal data record provided by this series of satellites has already helped scientists study global sea level rise and better understand how ocean circulation and climate change are related.

The Future

NOAA and its international partners have proposed launching the Jason-3 satellite to continue the ocean altimetry climate data record. Jason-3 is essentially a clone of the Jason-2 satellite and will allow NOAA to continue to monitor the upper ocean heat content and long-term variability in the ocean sea level.

Jason-3 is predicted to launch in 2013 and will operate for at least five years. It needs at least six months of overlap with Jason-2 to allow system calibration and validation. Re-using the Jason-2 design and spare components will reduce the cost of building and launching Jason-3. The cost will also be reduced by using the existing ground capabilities and through international partnerships with European agencies.

Photo courtesy of D. Ducros.



A satellite rendering of the Jason-2 satellite.

Managing Ecosystems



Created and Distributed a New SeaWinds Product

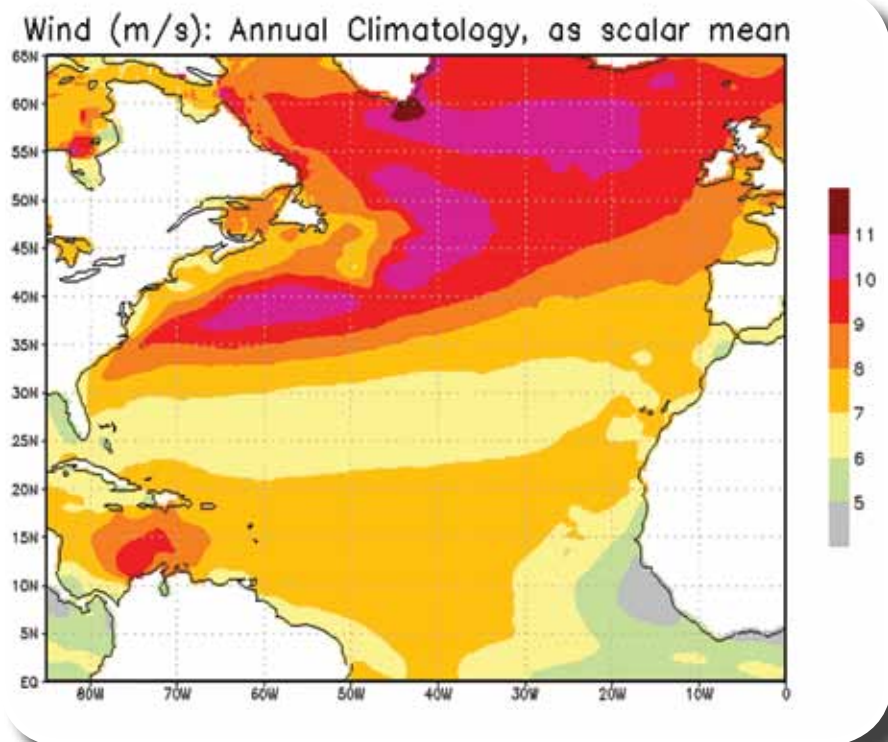
NOAA's National Climatic Data Center (NCDC) assembled over 20 years of remotely sensed data from multiple satellite-based instruments from national and international partners. With these data, NCDC produced a global high resolution sea surface wind product and distributed it worldwide to a variety of users, including the offshore energy sector, climate modelers, and the coastal ecosystem community. SeaWinds measurements provide information for several sectors of the public and research communities. SeaWinds provides wind climatologies for the Offshore Wind Energy community; is used by NOAA Coral Reef Watch to predict coral bleaching events; and provides

wind stress estimates for the ocean and climate modeling communities, including the coastal ecosystem community to aid in the production of coastal upwelling estimates.

Developed the Southern Alaska Coastal Relief Model

NOAA's National Geophysical Data Center (NGDC) developed a new integrated bathymetry and topography Coastal Relief Model (CRM) for Southern Alaska. This model shows Earth's surface and spans the Gulf of Alaska, Bering Sea, Aleutian Islands, and Alaska's largest communities: Anchorage, College, Fairbanks, and Juneau. CRM allows scientists to model tsunami propagation and ocean circulation. In addition, CRM may be used for benthic habitat research, weather forecasting, and environmental stewardship.

This first CRM of Southern Alaska also marks the beginning of a series of revised regional CRMs for the United States, which enables much more effective modeling of meteorological and oceanic circulations, climate modeling, and hazard modeling, such as tsunami propagation, tsunami inundation, storm surge, and sea level rise. The vast majority of Earth's surface is hidden under water. NGDC is updating the U.S. CRMs due to significant new data, enabling higher resolution CRMs developed on common vertical and horizontal datums. These models support coastal inundation mapping, tsunami propagation modeling, and habitat characterization.



Wind patterns, determined from NOAA satellite Climate Data Records, play an important role in Wind Energy site selection.

The Chesapeake Bay and other chlorophyll concentration products help track and predict algal bloom events, monitor water quality, and direct in situ water sampling and fisheries sampling efforts. For example, algal blooms can often lower oxygen concentrations in waterways, affecting the health of the marine life in the area. Data from the Chesapeake Bay chlorophyll product can allow natural resource managers to discover the cause of events such as fish kills and to track the ebb and flow of algal blooms in the area. This product is used by NOAA's Chesapeake Bay Office, the regional partnership Chesapeake Bay Program, and Maryland's Department of Natural Resources.

Supporting Commerce and Transportation



Used Nighttime Lights Data to Estimate Gross Domestic Product

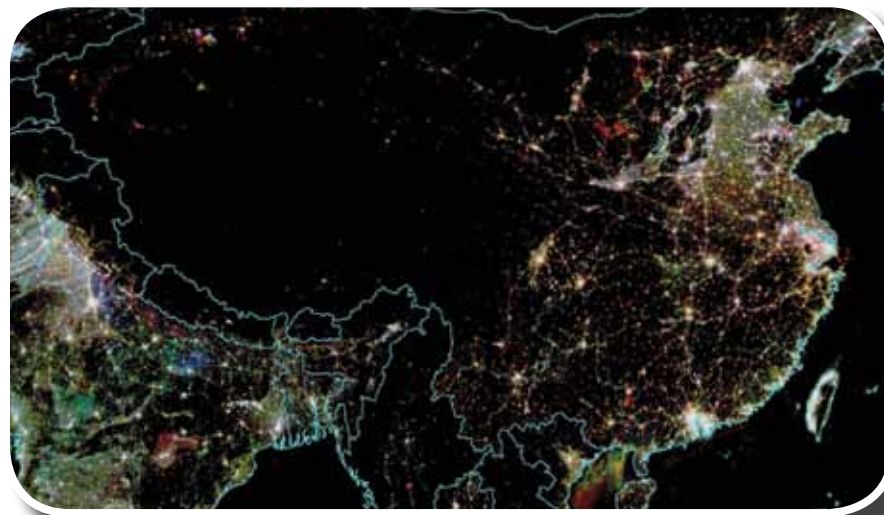
In 2009, NESDIS used nighttime lights data to produce the first satellite derived Gross Domestic Product (GDP) grid. GDP is key to evaluating and ranking the standings of economies worldwide. Traditional estimation GDP can be fraught with errors because of the difficulty in collecting the basic data, exchange rates, and other issues. Since there is a connection between wealth and the quantity of installed lighting, NESDIS used historical GDP estimates and nighttime lights data to validate this new method of GDP estimation.

The nighttime lights GDP grid reveals the variations in economic activity at a finer resolution than the national and state level GDP reporting. The grid can be viewed as a map of purchasing power. The nighttime lights GDP grid can be combined with other global data to define the location and size of markets and gaps in the placement of specific commercial services. This product has already been used by constituents such as telecommunication companies to optimize the placement of cellular communications.

Every five years, NESDIS regenerates the World Magnetic Model (WMM) based on a compilation of global magnetic observations, from land, sea, and satellite. NESDIS is currently constructing the latest WMM version, to be distributed in 2010. The high-resolution EMAG2 map complements the WMM by quantifying regional magnetic disturbances caused by localized concentrations of magnetic minerals in the Earth's crust. This information is important for applications with high accuracy requirements such as oil exploration.

Supported Safe Navigation through Enhancing the Marine Transportation System

NOAA's National Geophysical Data Center (NGDC) has primary archive and data stewardship responsibility for NOAA's Marine Transportation System



Nighttime Lights imagery of China. This color composite of lights is from three years: 2008 in red, 2000 in green, and 1992 in blue. Shifts in color towards red indicate growth, shifts toward blue indicate decline.

(MTS) program. NGDC's primary mission for the MTS program is to increase the volume of hydrographic survey data ingested and placed in the archive and the volume of data and information delivered online annually by 10 percent. Due to significant increases in both the number and volume of surveys, NGDC surpassed this milestone by more than doubling the archive in the last two years. Over 34 terabytes of new National Ocean Service (NOS) survey data were collected, processed, archived, and made available online in the first three quarters of 2009.

In FY 2009, NESDIS completed phase one of the North American Ice Services (NAIS) Common Production System Implementation Plan. NAIS will improve information exchange and enhance coordination between the National Ice Center and Canadian Ice Services. The integration of both centers' expertise and capabilities offer improvements and efficiencies in providing ice information for North America. This plan will help the North American maritime community and other organizations reduce risks to life, property, and the environment due to ice-related accidents.

Interview: Gary Davis, Director of the Office of Systems Development

Where did you grow up? And where did you go to school?

I grew up in New York City, moved to Maryland when I was about 12, and went to the University of Maryland.

How did you get started at NOAA/NESDIS?

After graduating from Maryland, I went to a career day to find out how I could work for NASA. There was a booth set up by NOAA with information about a graduate sciences program where they were willing to take you in, pay you, and send you back to school. It was quite a deal.

The first year of the program, I went to school, got a full-time salary, and got a degree in aerospace engineering; NESDIS was looking for somebody to start to work with satellites. I was hired by Dave Johnson and started right when we launched the first Synchronous Meteorological Satellites (SMS) and Geostationary Operational Environmental Satellites (GOES).

What is your position now, and how did you get there?

Right now I am the Director of the Office of Systems Development. When I started at NESDIS, I was the lead of the engineering branch working on the GOES spacecraft. Then we brought in the first polar satellites in the mid-1970s, and so I started working on the polar satellites. I had the great advantage of knowing how the satellites work and how they are built because I got a lot of training by going to the satellite vendors. I also had a chance to spend a lot of time at the Wallops, Virginia, and Fairbanks, Alaska, facilities.

Next, I became the Manager of the Satellite Operations Control Center (SOCC) and then Director of the Office of Satellite Operations. When John Hussey left the Office of Systems Development (OSD), they asked me to run both offices; I ran operations and development in both offices for about three years and then finally settled in at OSD.

How far has NESDIS come since your first GOES launch to the recent GOES-14 launch?

In the geostationary world, NESDIS has come quite far. We used to fly spinning GOES satellites, which were the first GOES all the way through GOES-7. Then we changed to a body stabilized satellite. Spinning satellites were like tops and saw the Earth for about 23 degrees. The rest of the time these satellites looked at space. The body stabilized satellites look at the Earth full time, so we are able to get many more images more quickly. This enabled us to work with the National Weather Service to reduce hurricane and tornado warning times.



Gary Davis shown here with former NOAA Satellite and Information Service Assistant Administrator David Johnson.

What is it about NESDIS that has enticed you to stay for over 30 years?

In NESDIS, you are like a big fish in a small sea. NESDIS is a small operation, and you personally can make a difference, you can make changes, you can influence policy. If you go to a bigger organization like NASA, there are a lot more people and much more bureaucracy, so it is much harder to make a change that you think would benefit the agency. Here, you have much more access to the Under Secretary of NOAA, and you can express your opinions. NOAA also has a lot of senior retreats where people get together and talk about what they are doing. At NESDIS I feel like I can talk to the NOAA leadership, and that is really why I stayed here.

What are your two most memorable experiences since you've been with NOAA?

First, I guess the GOES-G launch, which was kind of the worst experience I ever had. I watched the satellite go up, saw it veer off course, and heard somebody say, "This isn't right." The next thing I heard was a big noise because Range Safety blew up our spacecraft that we worked very, very hard on. That moment will always stick in my mind.

Second, the other launches that I've been to—and I've been to probably 25 or 30—were just wonderful. There is nothing like seeing your work come to fruition. You watch that rocket go up into space in a beautiful orbit and end up with a good satellite.

What advice do you have for the future of NESDIS satellites?

Keep focused, understand your requirements, make sure you build what your users need, and try to get rid of stuff that you don't need—which is very, very hard to do. But we have to keep replacing, and we have to keep moving forward, but we also have to understand that we are the organization for continuity of satellite operations and products. We can't afford a failure, and we can't afford an outage. We need to keep continuity going, and that's what NESDIS I think is the most famous for. We do one heck of a job just making sure we always have what's needed in orbit.

What are going to be NESDIS's biggest challenges in the next five to ten years?

Climate science and how we react if NOAA creates a climate service. Also, continuity of and funding for programs like Jason [altimetry satellite] and QuikSCAT

[scatterometry satellite] will be significant. As we try to expand to meet the ever changing demands of our user community, we have to figure out how to get funds above and beyond what we're doing today. We need to grow.

What is your favorite pastime outside of work?

For about 30 years, I've coached baseball. About two years ago, I stopped because work got pretty complicated. But that's been my pastime, and that's probably where I'll go when I retire.

Any last words?

It's been fun. I mean I've been here 32 years, and every year I enjoy coming to work. I also enjoy now being in the position to retire anytime I want. It gives you a whole new look at life when you're working. But right now, the NESDIS management is so good, our projects are so good, and we're doing so many things that I believe will make the difference and will leave the planet better for our kids. I want to hang around and do them.



Gary Davis at an American Meteorology Society event, with Mary Kicza, Assistant Administrator for Satellite and Information Services (middle), and Abigail Harper, Deputy Assistant Administrator, Systems (right).

Awards

GOLD MEDALS

Leadership

Albert E. Theberge, Jr. (NESDIS)

Office of Oceanic and Atmospheric Research Nomination
For the design, development, and opening with the Smithsonian Institution of the Sant Ocean Hall, the national exhibition on the global ocean.

Scientific/Engineering Achievement

Changyong Cao (ORA)

NESDIS Nomination

For leadership in developing and implementing an international framework for generating high-quality satellite data for climate monitoring.

SILVER MEDALS

Scientific/Engineering Achievement

Mark Eakin (ORA)

NESDIS Nomination

For providing timely ocean information and capacity for improved global monitoring and management of coral reef ecosystems relative to climate change.

Angelo G. Wade (OSD), J. Philip Green (OSD), Walid J. Bannoura (OSD), Linda Stathoplos (OSO), John L. Lillibridge III (ORA), Kim McCarty (OSO), Larry Ledlow (OSO), Brian Hill (OSO)

NESDIS Nomination

For designing and implementing a U.S. ground system for Europe's Jason-2 satellite to support worldwide weather forecasting and climate monitoring.

ADMINISTRATOR'S AWARDS

Chris Wheeler (OSO)

For outstanding technical leadership in managing the Geostationary Operational Environmental Satellite on-orbit constellation.

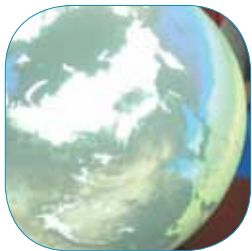
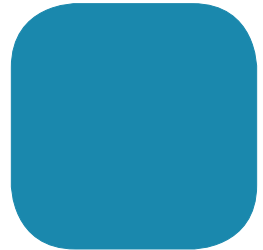
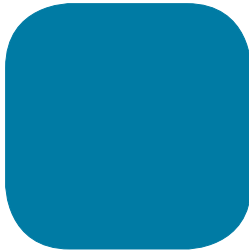
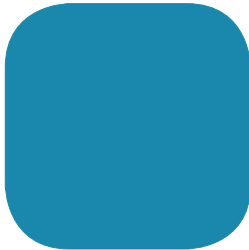
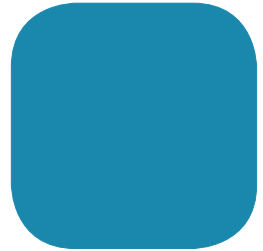
Pablo Clemente-Colón (ORA), Jeffrey Key (ORA)

For scientific leadership and excellence in support of domestic and international polar observing activities during the International Polar Year.

Yong Han (ORA), Fuzhong Weng (ORA)

For improving the accuracy of weather forecasts by developing new and powerful radiative transfer models and techniques to assimilate advanced satellite data.







ABADIA, ANTONIO
ABNEY, DIANA ABNEY, STANLEY ABREU, MI-
CHAE ADAMS, MARY ADKINS JR, ANDREW ALI, AISHA ALLEGRA,
ANDREW ALLEN, DONALD ALVI, KHALID AMBURGEY, KEITH ANDERS, DAWN ANDER-
SON, DAVID ANDERSON, DONNA ANDERSON, GLORIA ANDERSON, MICHAEL ANGEL, WILLIAM AN-
SARI, STEVEN ANZELC, JIMI APPERSON, CHARLENE APPLEQUIST, SCOTT ARGUEZ, ANTHONY ARNDT, DEREK
ARNFIELD, JEFFREY ATKINS, STEVEN AUNE, ROBERT AUSTIN, CAROL AVERSANO, GLORIA BAJPAI, SHYAM BAKER, CHARLES
BAKER, EDWARD BALDWIN, RICHARD BALDWIN, THOMAS BALLOU, JAMES BANAS, JOSEPH BANNOURA, WALID BANZON, PATRIA VIVA
BARANOVA, OLGA BARNET, CHRISTOPHER BARNETTE, ALVA BARRIENTOS, CELSO BATES, JOHN BAUER, BRUCE BAYLER, ERIC BEARD, RUSSELL
BEAVIN, MICHAEL BECK, CALVIN BECKER, THOMAS BELFIELD, KATHY BELLAMY, PHYLLIS BELLAMY, TONI BELOTE, PATRICK BELTER, CHRISTOPHER
BENNER, DAVID BERBERICH, KEVIN BERRY, EUGENE BERRY, PAULA BLACKWELL JR, FREEMAN BLOEDEL, BRIAN BLOOM, HAL BOSCH, JULIE BOTLUK, LISA
BOUKABARA, SID BOWMAN, DAVID BOYD, KANDIS BOYD, THOMAS BOYER, TIMOTHY BRADY, JAMES BRANCH, TIMOTHY BRANDON, TESS BRAUER, DOUGLAS
BRAUN, DEBRA BREGER, CAROL BREWER, MICHAEL BRIDGETT, DARBIE BRIELE, MARK BRINEGAR, DANNY BRINKER, RANDAL BRISCOE, ROBERT BROOKS, BARBARA BROOKS,
DONNISE BROOKS, TODD BROWN, BRIAN BROWN, CHRISTOPHER BROWN, DOROTHY BROWN, JANET BROWN-JENKINS, ROXIE BROWN JR, DANIEL BROWN, LINDA BROWN,
WILLIAM BRUEGMAN, OTTO BRUNSON, ALBERTA BRUST JR, JOSEPH BRYANT, CHARLES BRYANT, JERRY BRYANT, JULIE BUCKNER, CHARLES BURKHART, WILLIAM BURLEW JR, THEO-
DORE BURRESS, ROBIN BURRIS, MARY BURROUGHS, JONATHAN BYSAL, HYRE CALDWELL, PATRICK CAMBARDELLA, LOUIS CAMPAGNOLI, JOHN CAO, CHANGYONG CAPPS HILL, SHARON
CAREY, THOMAS CARPENTER, JAN CARPINO, CHRISTINE CARR, LARRY CARR, LILA CARROLL, DONALD CARTER, EMILY CARTER, LILLIAN CARTER, PRESTON CARTER, WILLIAM CARTWRIGHT,
JOHN CASEY, KENNETH CATALAN, JOSEPH CHALFANT, MICHAEL CHAMBERLAIN, KIMBERLY CHANG, CHOL CHANG, PAUL CHAPMAN, LAURA CHARNOCK JR, DOUGLAS CHEN, SAM CHERRIX,
HOMER CHERRY, TROY CHIEDI, ROSA CHOE, JAE CHOLID, LUKMAN CLAPP, JENNIFER CLARK, CRAIG CLARK JR, JOHNNY CLARK, NATHAN CLEMENTE COLON, PABLO CLEVENSTINE, SETH COHEE,
DONNA COLEMAN, BERRY COLEMAN, CARLA COLEY, RICHARD COLLIER, JUANITA COLLEY, SHARON COLLINS, DONALD COLLINS, KAY COLLINS, RONALD COLOHAN, PETER COMEYNE III, GUSTAVE CON-
NOR, LAURENCE COREN, THERESA COUTURE, JUSTIN CRAIG, ARLENE CRAIG, CONSTANCE CRAWFORD, VAN CRENSHAW, ANGELA CRISON, MICHAEL CROCKETT, DENNIS CROSS, SCOTT CROUCH, JUSTIN
CSISZAR, IVAN CUBANO, RUBY CUMBERPATCH, MARY CUMBIE, BRENDA CUSTIS, JOHN D'AGUANNO, JANE DAHLBERG JR, HARRY DAILEY, KEVIN DALAL, MANAN DANIELS, DAWN DANIELS, JAIME D'ANTONIO,
CAROLYN DAVIS, CHARLES DAVIS, GARY DAVIS, JOHN DAVIS JR, VAUGHN DEFARCESCO, NANCY DELGREGO, STEPHEN DEMARIA, MARK DENIG, WILLIAM DENIS, CHANTALE DEVINE, SUSAN DIAMOND, HOWARD
DIEDRICH, BENJAMIN DIGIACOMO, PAUL DING, HANJUN DIXON, LAKESHIA DOHERTY, KENNETH DONAHUE, DAVID DORFLER, JOSEPH DORFLER, KRISTIN DORSEY, JEROME DORSEY, WARREN DOUGLAS, EVE DOWNES,
MICHAEL DRAHOS JR, HENRY DRUMM, AMBER DUNBAR, PAULA DUNSTON, PATRICK DURAN, MICHAEL DURRE, IMKE DWIWEI, PARMESH DYSON, RUSSELL EAKIN, CARLON EASTERLING, DAVID EAST, TINA EBERTS,
DENNIS EDDY, DAVID EDINGTON, SUE EGGLESTON, MARGARET ELLISON, LEON ELSWICK, STANLEY ELVIDGE, CHRISTOPHER ERTLE, MARCUS ERWIN, EDWARD ESHAM, TERRI EVANS, ROBIN EWELL, ELIZABETH FAEUBACH,
JOHN FAUNCE, LISA FENNO, CHARLES FENWICK, CHRISTINE FERGUSON, ANGELA FERRARO JR, RALPH FINCHER, KATHERINE FINSON, ROBERT FIOLEK, ANNA FISCHMAN, DAVID FITCH, JEAN FITZMAURICE JR, MICHAEL FLA-
NAGAN, DANIEL FLEAMAN, ROBERT FLEMING, STEPHEN FLERLAGE, KAREN FLYNN, LAWRENCE FORD, TERRI FOREMAN, BERNADETTE FOREST, ELLIOT FOX, CHRISTOPHER FRANC, DAVID FRANKLIN, DEBORAH FRANKS, PHALA
FREDERICK, HELEN FROSTROM, GALLG ULTON, RICHARD FURGERSON, JOHN FURLONG, DAVID GALEONE, MICHAEL GALLA, GREGORY GALLO, KEVIN GARCIA, HERNAN GERWIG, RYANN GEVORGYAN, YANA GILBERTO, VICENTE
GLANCE, JR., WALTER GLASER, MARY GLEASON, BYRON GLEASON, KARIN GLINIAR, CARL GOHRBAND, HILDA GOLDBERG, MICHAEL GOLDBERG, MITCHELL GOLDSMITH, DAVID GOLDSTEIN, ZACHARY GOODMAN, STEVEN GOODRUM,
GEOFFREY GOSS, LYNN GOUDOUROS, JAMES GRAHAM, TYNA GRANO, VINCENT GRAUMANN, AXEL GRAY, DONALD GREEN, JOSEPH GREGG, MARGARITA GREGORY, PATRICK GRIFFIN, TRINA GRIFFIN, VANESSA GRIFFITH, STEVEN
GRIMM, PETER GRIPPANDO, STEVEN GRISHAM III, BYRON GROSS, WENDY GRUNIN, JASON GUCH, INGRID GURKA, JAMES GUTIERREZ, JOSE HABERMANN, RAY HAKKARINEN, IDA HALL, ALAN HALL, MARK HALL, NORMAN HAMLIN,
EDWARD HAMILTON, LAURA HAMILTON, MELANIE HAMMER, GREGORY HAMMOND, ANDRE HAMPTON, CYNTHIA HAMPTON, KARL HAN, DONG HAN, JING HANNA, JAY HAN, YONG HARDING, TODD HARPER, ABIGAIL HASENAUER,
DAVID HASTINGS, DAVID HAUGHEY, JAMES HAUSMAN, SCOTT HAY, BRENNAN HAYES, KESHA HAY, HEATHER HAYWOOD, KENNETH HEIDINGER, ANDREW HEILMEIER, LISA HEIM JR, RICHARD HEILFRICH, SEAN HENSLEY, GRACE HERMECK,
DAVID HERNDON, RHONDA HERRIN, TAMMIE HEYMANN, ROGER HEYSE, CHRISTINA HILL, BRIAN HILL, ERIC HILLGER, DONALD HILL, SHERIDAN HINSON, CONRAD HIRSCHFELD, OLIVER HOFF, LOUIE HOLLAND, CURTIS HORAN, KAREN
HORTON, TRIVITA HOSEINI, SEYED HOUSTON, TAMARA HOWARD, STEPHEN HOWARD, TIMOTHY HUDSPETH, PAUL HUFF, PATRICIA HUGHES, BRIAN HUGHES, KENT HUGHES, PAMELA HUMPHRIES ROBINSON, BRENDA HURCOMBE, STACEY
HURST, KIMBERLY HURT, LISA HUTCHINGS, TOBY HYATT, GLENN IGNATOV, ALEXANDER INGRAM, CHERYL IRVING, ANTONIO JACKSON, CONRAD JACKSON, NINA JACOBS, RUSSELL JAMES, GREGORY JAMES, LAWRENCE JAMES, RICHARD JAMIL,
IFTIKHAR JANOSKI, STEPHEN JENSEN, JOHN JENSEN, MICHAEL JOCHUM, MATTHEW JOHNSON, CHERISH JOHNSON, CHERYL JOHNSON, DAPHNE JOHNSON, DENNIS JOHNSON, GREGORY JOHNSON, LATONYA JOHNSON, PHILIP JOHNSON,
ROMONTE JOHNSON, THADDEUS JOHNSON, THELMA JONES, QUEEN JUNGBLUTH, GEORGE KADIN, CHARLES KALB, MICHAEL KALLURI, SATYA KARL, CYNTHIA KARLSON, DANIEL KARL, THOMAS KASKE, NEAL KATZ, MARIAN KAZIOR, MARILENE
KEARNS, EDWARD KELLY, KATHLEEN KEY, JEFFREY KIBLER, JAMIE KICZA, MARY KIHN, ERIC KILCOYNE, HEATHER KIM, DONGSOO KIM, JASON KING, BEVERLY KINSFATHER, JOHN KIRKNER, STEVEN KLEESPIES, THOMAS KLEIN, JOSEPH KLUISCHER,
MARY KNAFF, JOHN KNAPP, KENNETH KNISKERN, KRISTIN KOBAR, JOHN KOENIG, CHAD KOGAN, FELIX KONDRAGUNTA, CHANDRA KONDRAGUNTA, SHOBA KOSSIN, JAMES KOWAL, DANIEL KRAFT, JOSEPH KROB, JEFFREY KUHN, ANGELA
KUHN, JOHN KULIGOWSKI, ROBERT KUSSELSON, SHELTON LACKEY, DENNIS LANG, JOHANNA LA ROCQUE, JOHN LARSEN, MARIA LASHER, BLAKE LASZLO, ISTVAN LAWRENCE, REGINALD LAWRIMORE, JAY LAWSON JR, ALEX LAYNS, ARRON
LEARY, TIMOTHY LEDLOW JR, LARRY LEDUC, SHARON LEFLER, DONNA LEUGECKI, RICHARD LEULIETTE, ERIC LEVINSON, DAVID LEVINSON, KEITH LEVITUS, SYDNEY LEWIS, JAMES LIANG, KIRK LIEF, CHRISTINA LILLIBRIDGE III, JOHN LINDSEY,
DANIEL LINVILL, GEORGE LITTLE, BRIAN LI, XIAOFAN LOBLEIN, BRENDA LOBLEIN, ROSS LOGAN, JEFFERY LOGAN, KELLY LOTT IV, JACK LOVE BROTKA, SUSAN LOVING, JOHN LUDLUM, KEVIN MACFARLAND, CHARLES MACNEILL, BARBARA
MADSEN, ERIC MAHMOT, RONALD MAHONEY, PATRICIA MAILHOT, DENNIS MAIZEL, LESLIE MAK, CHRISTINA MA, LIQUN MANDT, GREGORY MANI, JOSEPH MANNS, DANIEL MARCHANT, DEBRA MARKEL, ANNE MARKS, KAREN MARTIN JR, JAMES
MASON, BROOKS MASTIN, DEANA MATHEWS, KARON MATURI, EILEEN MAYBIN, BILLIE MAYO, PATTY MAZUR, WILFRED MCCADO, DAVID MCBRIEN, GARY MCCARTY, KIMBERLY MCCOWN, MILTON MCCULLOUGH, HEATHER MCDONALD, KENNETH
MCELREATH, DOUGLAS MCGAHEE, ALVIN MCGILL, JOLENE MCGINNIS, DAVID MCGUIRK, MARJORIE MCINTOSH JR, VERNON MCKENZIE, KEITH MCKINLEY, ALITA MCLEAN, SUSAN MCMATH JR, ALBERT MCNAMARA, DONNA MCNEAL, KELLY
MCQUILKIN, ROBERTA MEDINA, MARTIN MEHTA, AJAY MENG, HAUN MENNE, MATTHEW MENTZER, JAMES MENZER, FRANK MERCKLE, NANCY MESICK, SHARON METCALF, LAURA METZGER, DAN MICHAEL, ANGELA MIGNOGNO, MICHAEL
MILANO SCHOSER, SUZETTE MILLER, EDWARD MILLER, ERIC MILLER, KAREN MILLER, LAURENCE MILLS, BARRY MITCHELL, GARY MOHLER, LARRY MOLENAR, DEBRA MOODIE, LINDA MOORE, CARLA MOORE, DANIEL MOORE, JEANNETTE
MOORE, JOHN MOORE, KELVIN MORAN, JOHN MORGAN, BEVERLY MORRIS, JAMES MO, TSAN MOWERY, SCOTT MULHOLLAND, MARK MULLER, DANIEL MULLIGAN, JOSEPH MULLIGAN, PATRICIA MUNDY, GREGORY MURPHY, MARILYN
MURPHY, WILLIAM MURRAY, DERRICK MURRAY, REGINA MUSSMANN, JAMES NAGAN, ROBERT NAUMAN, SELINA NAVE, CHERYL NEELY, LINDA NELSON, RYAN NEROL, TERESA NEWLIN, MICHELE NEWLON, CARL NGUYEN,
VIHA NICHOLS, CATHERINE NIKLEWSKI, DAVID NOCK, WILLIAM NORRIS, TEELA NORTHROP, CLINTON NUNN, BRADLEE NYE, KIMBERLY O'CHERY, MARY O'CONNORS, CHRISTOPHER O'DELL, MICHAEL OGATA, ERIC OLSON, JON ONDRUSEK,
MICHAEL OWEN, KAREN OWEN, TIMOTHY PAGEL, BONITA PALECKI, MICHAEL PALUBA, RHONDA PAQUETTE, JOHN PARENT, GREGG PARHAM, ANTONETTE PARIS, CECIL PARKER, JAMES PARK, FREUD PARKS, MARGARET PARSONS,
ARTHUR PATTERSON II, SAMUEL PAVAR, CHRISTOPHER PAVOLONIS, MICHAEL PAYNE, ERNEST PEARSALL, HERALD PECK, VICKI PEGNATO, PAUL PEJSA, JESSICA PENN, RONALD PEREIRA, JOHN PEREZ, JOSEPH PERKINS, MARLIN PERLOTH,
JOEL PETERS, JOYCE PETERSON, THOMAS PETTIS, ROSEMARY PHILLIPS, ANGELA PHILLIPS, JOHN PHILLIPS, SHIRI PICHEL, WILLIAM PIERCE, ROBERT PIKULA, LINDA PITTMAN, KAROL PLOTT, BRUCE PORCH, MICHAEL POWELL, ALFRED
POZNIAK, ALEXANDER PRENDERGAST, KELLY PRESSLEY, VIRGINIA PRIVETTE, JEFFREY PRYOR, KENNETH QI, HONGMING QUILLLEN, STEVEN RADEMACHER, RONALD RAMSAY, BRUCE RANDALL, TRACEY RANK, ROBERT RAY III, HENRY
RAY, JAMES RAY, RONALD REALE, ANTHONY REDMON, ROBERT REEDY, GEORGE REEVES, LETICIA REICH, JESSE REID, TINA RELPH, JOHN RENKEVENS, THOMAS REVELL, ALAN REYNOLDS, RICHARD REYNOLDS, THOMAS RICH-
ARDSON, RASHELLE RICH, SHARON RIDDLE, DEBORAH RIEFLER, GEORGE RIGGIN, BARRY RIPLEY, MARGARET RITCHEY, NANCY RIVERA, CARMELO RIVERA, DEBORA RIVERS, ANN ROBEL, JEFFREY ROBERTS, THOMAS ROBINSON,
ALAN ROBINSON, ANGEL ROBINSON, BRITTANY ROBINSON, DIANE ROBLIN, ROBERT ROBY, DONALD ROCHESTER, JENNIFER ROGERS, CAROL ROKKE, LAURIE ROSARIO, JOSE ROSS, DOUGLAS ROSS, THOMAS ROSS, WARREN
ROYSTON, JOE RUBIO, LINDA RUMINSKI, MARK RUTLEDGE, GLENN RUTZ, STEVEN RYAN, THOMAS SALAZAR, JOSEPH SALEMI, ANTHONY SALTERS, LINDA SANCHEZ-LUGO, AHIRA SANCHEZ, PATRICIA SANNS, JOHN SAPPER,
JOHN SAUNDERS, LEESHA SAWYER, KERRY SAZAMA, CHARLOTTE SCHAEFFER, STEPHEN SCHAFFER, STEVEN SCHAFFERT, KAREN SCHEIN JR, GUY SCHELLER, BONNIE SCHENCK GARDNER, ELIZABETH SCHLEICHER JR,
WALTER SCHMIDT, KENNETH SCHMIT, TIMOTHY SCHOTT, THOMAS SCHREITZ, RICHARD SCHWARTZ, ALAN SCOTT, TAMMY SEIDERMAN, MARK SEMAN, LANCE SEMUNEGUS, HILAW SERAFINO, GEORGE SESSING, JANICE
SETTLES, MICHAEL SEYBOLD, MATTHEW SEYMOUR, PAUL SHAFFER, JOYCE SHARKEY, HOW SHARMA, AVDHESH SHARMA II, GEORGE SHEA, EILEEN SHEFFLER, DUSTIN SHEIN, KARSTEN SHERIDAN, JAMES SHI,
LEI SHIRLEY, JOSEPH SHRESTHA, MAHENDRA SILVA, HERNAN SIMKO, JOHN SIMPSON, NAAMAN SINCLAIR JR, GEORGE SINNOK, RALPH SLACK, DONNIE SLAY, MARY SLEEPER, MARK SLUSSER, CONSTANCE
SMILEK, RONALD SMITH, ADAM SMITH, ALISA SMITH, DAVID SMITH, DAVID SMITH DEARING, RHAPSODY SMITH, ELIZABETH SMITH, JONATHAN SMITH JR, THOMAS SMITH, LAKE SMITH,
RICHARD SMITH, THOMAS SMITH, WALTER SMOLYAR, IGOR SMYLY, MARSHALL SNEAD JR, ROBERT SNELL, THOMAS SOLOMON, NICOLE SPEIDEL, JESSE SPENCER JR, ALBERT SPENCER, TERESSA SQUIRES,
MICHAEL STANCZYK, STANLEY STANSBURY, ANGELA STARKE, SUSAN STATHOPLOS, LINDA STATLER, LINDA STENGEL, ERIC STEPHENS, SCOTT STEURER, PETER STEVENS, ADELE ST GERMAIN, KAREN
STINUS, JOSEPH STOCKTON, DANIEL STRAND, JESSE STREETT, DAVID STROKER, KELLY SULLIVAN, MATTHEW SUMMERS, ROBERT SUN, LEANGCHWAN SURRETT, NIKONDA SWANSON, GRACE
SYLVESTER, DENISE SYMONDS, JASON TABOR, EDWARD TAI, CHANG KOU TANNER, MICHAEL TARVER, KENDRA TAYLOR, LISA TAYLOR, PAMELA TERRY, GENE TERRY, ROE TESSIER, MARGARET
THERGE JR, ALBERT THOMAS, ADRIENNE THOMAS, JOHN THOMASON JR, CHARLES THORNTON, JOSEPH TIELKING, TERRANCE TIGNOR, CLARENCE TILLMAN, ARLA TODIRITA, MONICA
TOMLINSON, MICHAEL TRUITT, NORWOOD TSUI, YO KUNG TUCKER, JAUVOONNE TURK, MICHAEL TURNER, KEVIN TWITTY, ANTHONY UNDERHILL, ERIC URBANSKI, DAVID URZEN,
MICHAEL VALENTI, JAMES VALENZUELA, MANUEL VARGAS, MARCO VEASEY, SARA VINCENT, KATY VIZBULIS, FREDERICK VOSE, RUSSELL VOSS, BRIAN VOYLES, JOYCE VYAS,
SUDHIR WADE, ANGELO WADE, CRAIG WADE, GARY WAHL, EUGENE WALKER, LEESALEE WALLACE, CAROL WALLACE, STEVEN WALLING, BRIAN WALL, JANET WALSH,
TIMOTHY WALTERS, STEPHEN WANG, MENGHUA WARD, DARLENE WARDRETT, ANDREW WARD, RODNEY WARNICK, BARBARA WARNEKEN, ROBIN WARREN, CHRIS-
TOPHER WARREN, DANETTE WARREN, DONNA WARREN, MICHAEL WARRINGTON, EUNICE WEIR, PATRICIA WELDON, ROGER WENG, FUZHONG WESTON,
KAY WHALEY, PHILIP WHEELER, CHRISTOPHER WHITEHURST, HILERY T J WHITE IV, JOSEPH WHITELEY, HARRY WHITE, SANDRA WILCZYNSKI, PETER
WILKINS, BRENDA WILKINSON, CHARIS WILKINSON, DANIEL WILLIAMS, ALEXANDER WILLIAMS JR, CLAUDE WILLIAMS, KEVIN WILLIAMS, LINDA
WILLIAMS, LINDSEY WILLIAMS, STEPHANIE WILLIAMS, TYRONE WILMESHERR, MARK WILMOT, WAYNE WILSON, WILLIAM WOLDU,
VERNELLE WOLF, WALTER WOMACK, WINIFRED WOOD, HELEN WOODS, LENORA WOOLDRIDGE, CHARLES WORMAN, RUS-
SELL WRIGHT, VICKIE WRUBLEWSKI, THOMAS WUERTZ, DAVID WU, XIANGQIAN WU, ZHONG YAPUR, MARTIN
YOE, JAMES YOUNG, SHAROLYN YUAN, MARGARIDA YU, YUNYUE ZEGALIA, STEVEN ZEHAR, DAVID
ZEIGLER, CYNTHIA ZEILER, TRACY ZEKRI, MEHDI ZHANG, HUI MIN ZHAN, XIWU
ZHAO, LIMIN ZHAO, XUEPENG ZHOU, LIHANG ZHOU, CHENG ZHI